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Analysis Feasibility Study of Smart Chicken Feeding Protection and Wiring System

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The development of Internet of Things (IoT) technology has encouraged the implementation of automation systems in the livestock sector, particularly to improve the efficiency of chicken feeding processes. This study aims to analyze the feasibility of the protection system and wiring design in a smart chicken feeder to ensure safety, reliability, and operational efficiency. The system is designed using a microcontroller, sensors, actuators, and an electrical network equipped with protection components such as fuses, miniature circuit breakers (MCB), and grounding systems to prevent overcurrent, short circuits, and potential device damage. The research method includes wiring diagram design, power requirements analysis, protection system evaluation, and performance testing of the device under operational conditions. The analysis results show that the implementation of an appropriate protection system can improve device safety, reduce the risk of electronic component damage, and ensure continuous automatic and scheduled feeding. The feasibility study concludes that the designed protection and wiring system meets technical, economic, and operational aspects, making it suitable for implementation as an appropriate technology solution to support productivity in automated poultry farming.
Keywords: IoT, smart chicken feeder, protection system, wiring, automation, and feasibility study.

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1. Introduction

Technological advancements continue to develop rapidly and have penetrated various sectors, such as industry, agriculture, and animal husbandry. Technological innovation is expected to improve the quality of human life while simplifying various daily activities. The use of technology in Indonesia is also increasingly widespread, including in the chicken farming sector, a major contributor to national food needs. The application of technology in the livestock sector not only aims to increase productivity but also helps farmers manage resources more efficiently, effectively, and sustainably. According to data from the Central Statistics Agency (BPS), broiler chicken production in Indonesia reached more than 3.5 million tons in 2022. North Sumatra is one of the provinces that makes a significant contribution, with production reaching more than 300,000 tons. This demonstrates the poultry farming sector's crucial role in meeting the community's animal protein needs. However, farmers still face various challenges, particularly in operational efficiency, time management, and the use of appropriate technology. Animal husbandry is the activity of cultivating animals to obtain benefits in the form of food and economic value. One crucial aspect of the chicken farming business is the feeding process, which must be carried out regularly and on time. In general, chicken feeding is still done manually by sprinkling feed into containers provided inside the coop. This conventional method requires significant labor and time, especially on farms with large numbers of chickens. Furthermore, delays in feeding can impact chicken growth and reduce farm productivity. Advances in Internet of Things (IoT) technology have enabled the creation of automated

ISSN 2722-4635

chicken feeding systems that can improve farmer efficiency. These systems utilize time sensors, microcontrollers, and mechanical components to automatically schedule feeding according to needs.

Although automated chicken feeding technology has advanced, several common problems persist, such as cable damage due to improper use, loose connections, and lack of regular maintenance. Furthermore, external electrical disturbances such as voltage surges can also damage electronic systems. Therefore, a feasibility study of the protection and wiring systems is necessary to ensure that the smart chicken feeder can operate optimally, safely, and efficiently. Based on this background, this study was conducted to analyze the feasibility of the protection and wiring systems for a microcontroller-based, solar-powered smart chicken feeder. The results are expected to provide recommendations for designing a standardized protection system, thereby improving the reliability of the device and supporting the development of automation technology in the chicken farming sector.

2. Literature Review and Problem Statement

Arduino UNO

Arduino is a software and hardware system used to control electronic devices such as current sensors, voltage sensors, and electric motors.Development Equipment (Arduino IDE) is software for developing a designed program and allows the designed program to be uploaded to the Arduino board. A program is a collection of instructions used to control a computer. The Arduino board is an electronic board that contains an ATMega-based microcontroller, while a microcontroller is a chip (integrated circuit) that contains a processor or processing and also memory that aims to store data. Arduino Uno is a microcontroller board based on the ATmega328 (datasheet) (Banzi & Edition, 2011). Arduino Uno has 6 analog inputs, a 16 MHz Crystal oscillator, a USB connection, a power jack, an ICSP header, 14 digital input/output pins (6 pins can be used as PWM outputs) and a reset button. Arduino is activated by connecting it to a computer using a USB cable or supplying it with an AC to DC adapter or using a battery (Suprianto et al., 2019).

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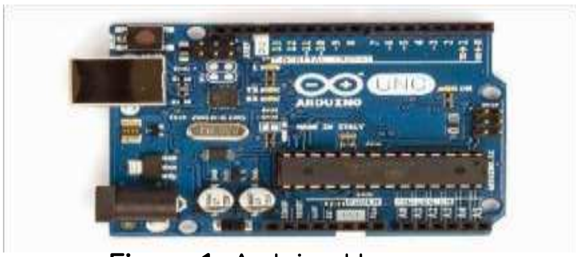

Figure 1. Arduino Uno

PinsThe power of the Arduino is as follows:

Input voltage (VIN.)The Arduino board has an input voltage to the Arduino board of 5 Volts to 12 Volts which can be accessed from a USB connection or a regulated power supply. 5V output voltage. This output pin is a 5V output voltage regulated by the regulator on the Arduino board.Arduino can be supplied with either a DC power jack (7-12V), USB connector (5V), or the VIN pin of the board (7-12).

ISSN 2722-4635

The output voltage is 3.3V. The 3.3 Volt output pin is generated byArduino board. The maximum current that can be passed is 50 mA. PinGND. This is a ground pin that can be connected to equipment such as sensors for the ground pin on the Arduino board.

The ATmega328 has 32 KB of memory (where0.5 KB of memory is used for the bootloader). The ATmega328 also has 2 KB of SRAM and 1 KB of EEPROM (which can be written and read (RW/read and written) with the EEPROM library). The Arduino Uno has physical characteristics, where the Arduino Uno board has a maximum width and length of an Arduino Uno PCB of 2.1 inches and 2.7 inches respectively, with a power jack and USB connector that extend the dimensions of the Arduino Uno board. Four screw holes allow the Arduino Uno board to be mounted or assembled into a box or surface. Note that the distance between digital pins 8 and 7 is 160 mil. (0.16"), not an even multiple of the 100 mil distance from the other pins.

Figure 2. Physical form of Arduino Uno
Source :(Banzi & Edition, 2011)

How Solar Cells Work

RayThe sun consists of very small particles called photons. When exposed to sunlight, photons, which are particles of sunlight, hit the silicon semiconductor atoms of solar cells, thus generating enough energy to separate electrons from the atomic structure. The separated and negatively charged (-) electrons will be free to move in the conduction band region of the semiconductor material. Atoms that lose electrons will have vacancies in their structure, these vacancies are called "holes" with a positive (+) charge (Sianipar, 2017).

AreaSemiconductors with free electrons are negative and act as electron donors, this semiconductor region is called N-type semiconductors. Semiconductor regions with H are positive and act as electron acceptors called P-type semiconductors. In terms of the process, the working principle of photovoltaic solar cells can be analogized with diodes. Basically, a diode is a coil consisting of P-type semiconductors and Q-type semiconductors. In order to form a P-type silicon semiconductor, it can be done by adding 5-valence materials, including Foster and Arenakum. Meanwhile, in order to form a Q-type semiconductor, the semiconductor will be designed with a valence of 4 by adding 3-valence materials, which are usually known as impurity materials. These types of impurity materials can be baron, aluminum, indium, and calcium. Through the addition of these impurity materials, it is possible to produce an electron material that will partially form holes (holes) where these holes can move from one location to another depending on the dimensions of the change. The changing conditions based on the crystal structure will cause new holes to appear, allowing electrons to fill the voids. This can indicate the magnitude of the current received based on the diameter of the resulting holes.

The process of electron movement from P to Q results in a change from the valence band to the conduction band. Different holes on one side of the P type move to one hole in the Q type position, so that vice versa, electrons in the Q type will move to electrons in the P type, and this is able to produce a gap or gap energy that is able to separate the valence band and the conduction band. The movement of these two positions will create a big that can be initialized with the R type. If the R and Q sides are connected to a predetermined load (result), electric power will be obtained. Through these two layers, one electron will be produced. This electric field cannot limit the electron hole barrier to recombine. Thus, this tool is able to experiment with a small power generator that is generally input from solar energy.

SCC (Solar Charge Control)

SCC solar panels areA solar power plant (PLTS) component used to optimize battery charging powered by solar panels (Imam Wijaya Siagian, 2023). This component works by regulating the charging voltage and current to match the power available from the solar panel. It also displays information about the battery's charging status. Measurements include the panel voltage, battery voltage, and the current flowing to the battery. To find the panel's output energy, multiply the panel's power by the length of time the panel has been operating. Calculating electrical power requirements can be done by calculating the total electrical power required to operate the chicken feeder and waterer, by calculating the power requirements from the solar cell

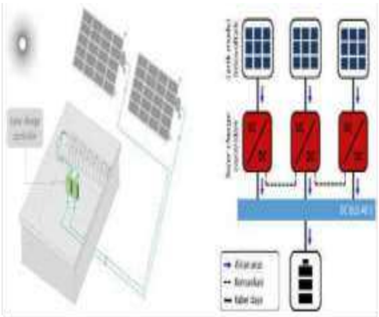

Figure 3. SCC PLTS Installation Location

Solar Charge Controller is not only for optimizing battery charging fromsolar panels, other SCC functions follow its specifications. Some of the functions of the Solar Charge Controller in a solar power generation system circuit include: Converting high-voltage DC current from solar panels to low-voltage current according to battery capacity, such as 48 VDC (Imam Wijaya Siagian, 2023). Reducing the charging current to the battery when the battery is full, this method of working is intended to protect the battery from overcharging. Batteries that are continuously charged even though they are full can result in gas and even explosions. Optimizing power transfer from solar panels to batteries with the Maximum Power Point Tracker (MPPT) algorithm. Preventing backflow from the battery to the solar panels at night or when sunlight intensity is insufficient. Displaying information on voltage, current, energy amount from solar panels, and energy sent to the battery.

Automation Technology in Animal Husbandry

The development of automation technology has had a significant impact on the livestock sector, particularly in improving operational efficiency and productivity. Automation technology enables previously manual processes to be controlled automatically with the aid of electronic systems and software. In chicken farming, automation technology is widely used in feeding systems, cage temperature control, humidity control, and livestock health monitoring systems. The use of automated systems can help farmers reduce reliance on manual labor, improve feed consistency, and minimize human error. Internet of Things (IoT)-based technology allows devices to be connected via the internet so that data can be monitored in real time. This system makes it easier for farmers to monitor cage conditions and ensure feeding runs according to a predetermined schedule. Thus, the application of automation can increase time efficiency, reduce operational costs, and improve the quality of chicken farm production. An

ISSN 2722-4635

automatic chicken feeding system is a device designed to distribute feed on a scheduled basis without the need for direct human intervention. This system typically consists of a microcontroller, time sensors, drive motors, feed containers, and a feed distribution mechanism. The microcontroller serves as a control center that regulates feeding times based on a predetermined program. A timer sensor is used to ensure consistent feed delivery according to the chickens' needs. Using an automatic feeding system offers several advantages, including increased labor efficiency, maintaining a consistent feeding schedule, and promoting optimal chicken growth. Furthermore, this system can reduce feed waste because the amount of feed provided can be adjusted according to needs. With an automated system, farmers can significantly improve productivity and the quality of their livestock.

Electrical Protection System

Electrical protection systems are a crucial component of electronic device design, ensuring the system's safety from electrical disturbances. Common electrical disturbances include overcurrent, short circuits, surge voltages, and leakage currents. Without a proper protection system, electronic devices can be damaged and even pose a fire risk. Commonly used protection components include fuses, miniature circuit breakers (MCBs), relays, and surge protectors. Fuses act as safety devices, interrupting the flow of electricity in the event of excessive current. MCBs are used to protect electrical circuits from overloads and short circuits. Surge protectors protect devices from voltage surges that can damage electronic components. Furthermore, a grounding system is necessary to channel the fault current to the ground, preventing device damage and protecting users from electrical hazards. Wiring is the process of connecting various components within an electronic system. Good wiring design must adhere to electrical safety standards, cable material quality, and proper circuit configuration. Errors in wiring installation can lead to system disruptions, component damage, and even the risk of fire. In a smart chicken feeding system, wiring connects the power supply, microcontroller, sensors, and drive motors. Using standard cables, strong connections, and proper component placement are crucial to ensure optimal system performance. Furthermore, regular inspection and maintenance are necessary to prevent damage from worn cables, loose connections, or environmental disturbances.

3. Method

This type of research is qualitative researchby examining the feasibility of the protection system and wiring for the pinta chicken feeder. This research will be carried out with a total time required for 4 months. To gain basic knowledge about everything that supports this research using references from books, journals and also other articles. The research and testing of this tool was carried out in a miniature tool located on Jalan Gatot Subroto, Gg. Pertama No. 39E. The steps used to complete this research were that the author applied several methods –Data collection methods to obtain the necessary research data. The methods used are as follows: This is one of the data collection methods applied by the author by observing or reviewing directly at the research location to find out and verify data from the smart chicken feeder protection and wiring system. This is one of the data collection methods applied by the author by reading, recording, and managing research materials from other licensed sources such as books and previously conducted research with related topics and discussions. This is one of the data collection methods applied by the author by asking questions or having direct discussions with related parties at the research location or with other parties who understand the topic of this research. The data required by the author is research data on the analysis of the feasibility system of the smart chicken feeder protection and wiring system. This is data collected or obtained by the researcher directly from the primary data source. Primary data is also referred to as original data or new data that has a current nature. To obtain primary data, the researcher must collect it directly. Methods that can be used by researchers to collect primary

 ISSN 2722-4635

data include observation, interviews, and questionnaire distribution. This is data obtained or collected by researchers from various existing sources (the researcher as a second-hand). Secondary data can be obtained from various sources such as books, reports, journals, and others. The following is a research flowchart: Research materials are all sources of information used in a study. The following are research materials obtained at the research location.

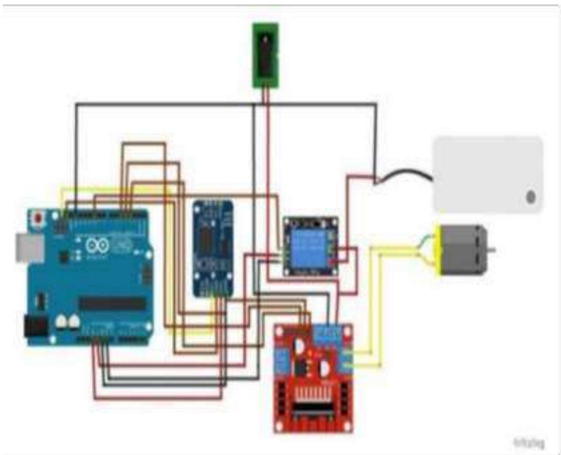

Figure 4. Smart Chicken Feeder Circuit Diagram

4. Results And Discussion

Research Results

The results of the research are a re-examination of the validity of the research. From the resultsAnalysis of the Feasibility Study of the Smart Chicken Feeder Protection and Wiring System by the author in accordance with the work indicators and problem formulation explained previously, the following data was obtained:

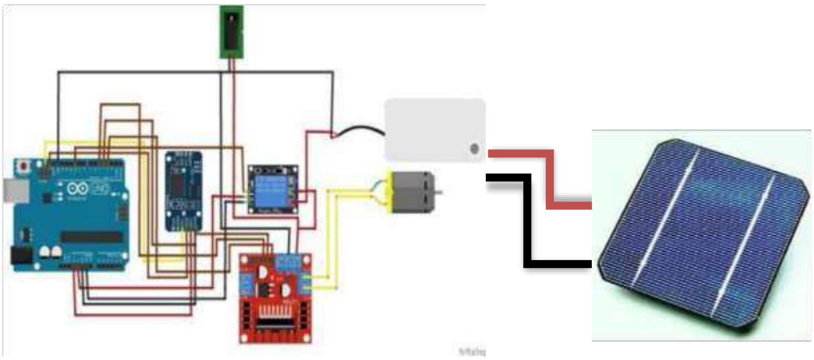

Figure 5. Tool Circuit Schematic

Table 1. System Voltage and Current Testing

No	Test Conditions	Input Voltage (V)	Output Voltage (V)	Current (A)	Status
1	No burden	12.5	12.4	0.05	Normal
2	Arduino active	12.4	11.9	0.12	Normal
3	Active motor	12.3	11.5	0.45	Normal
4	Motor + Active Sensor	12.2	11.3	0.52	Normal
5	Maximum load	12.0	11.0	0.60	Normal

 ISSN 2722-4635

Feasibility of the Protection System on the Smart Chicken Feeder

On the toolIn a solar-powered smart chicken feeder, a protection system plays a crucial role in ensuring the device operates safely and efficiently without the risk of component damage due to electrical disturbances. One of the key components in this system is a relay, which functions as an automatic switch to control electrical loads such as the DC motor used in the feed drive. Therefore, selecting the right relay must take into account technical specificationsThe load to be controlled, including the required voltage and current. A suitable relay for use in this device is one with a coil operating voltage of 5V, because the Arduino Uno, which serves as the system's control center, outputs a 5V voltage on its digital pin. Furthermore, the relay selected should have a low coil operating current, below 40mA, to ensure compatibility with the Arduino's capabilities. The SRD-05VDC-SL-C relay, capable of handling loads up to 250VAC/10A or 30VDC/10A, is a suitable choice for this system. In its implementation, the use of a relay driver is an important solution if the controlled load requires a current greater than the Arduino's capacity. The relay driver can be equipped with a transistor, such as the NPN type 2N2222, which allows control of loads with higher currents. A simple circuit can be created by connecting the transistor's base to the Arduino pin through a 220Ω resistor, the transistor's collector to the relay's coil pin, and the transistor's emitter to the Arduino's ground.

BesidesFurthermore, the protection system is also equipped with several additional components to improve the safety and operational stability of the device. A flyback diode, such as the IN4007, is installed in parallel with the relay coil to prevent reverse voltage spikes that could damage system components. Capacitors can also be used to reduce electromagnetic interference that could potentially disrupt the system's operation. The relay control in this smart chicken feeder can be programmed using simple code on an Arduino Uno. For example, the following code shows how to activate and deactivate a relay with a time delay:

System Feasibility Status TestingProtection.

In order toTo improve the safety and efficiency of the solar-powered smart chicken feeder system, researchers need to connect the protection system directly to the Arduino Uno, which acts as a control center. In previous research, the protection system only relied on passive components such as relays and drivers without involving direct supervision by the Arduino. Therefore, to strengthen the system and provide more optimal protection, the following steps can be taken. The first step is to add sensors to detect electrical disturbances, such as overcurrent or overvoltage. These sensors will provide information to the Arduino about the system's electrical status. For example, by using a current sensor such as the ACS712, the Arduino can monitor the current flowing through the load. If the current exceeds a predetermined safe limit, the sensor will signal the Arduino to take the necessary action, such as turning off the relay or alerting the operator.

Table 2. Protection System Testing (Fuse and MCB)

No	Types of Disorders	System Condition	Protection Response	Response Time	Information
1	Normal current	The system is running	Unbroken	-	Normal
2	Overload	Current increases	Fuse cuts off the current	1 second	Functioning
3	Simulated short circuit	Very high current	MCB trip	< 1 second	Safe
4	Voltage surge	Voltage rises	Stable system	-	Safe

 ISSN 2722-4635

No	Types of Disorders	System Condition	Protection Response	Response Time	Information
5	Loose cable	Unstable current	System stopped	2 seconds	Needs improvement

Similarly, to monitor excess voltage, researchers can use voltage sensors.Such as the ZMPT101B. This sensor allows the Arduino to read the voltage in the system and detect any voltage spikes that could damage components. If the detected voltage exceeds a predetermined threshold, the Arduino can decide to cut off the flow of power to certain components, such as the feed motor. Once the sensor is connected to the Arduino, the protection system can be controlled through proper programming. The Arduino, as the main controller, will receive information from the current and voltage sensors, then process the data to ensure that all components are operating within safe limits. If a disturbance is detected, such as excessive current or voltage, the Arduino will send a signal to disconnect the relay and cut off the flow of power to the motor or other components that may be affected.

ImportantIt's worth noting that using a relay driver, such as the 2N2222 NPN transistor, is an important solution if the controlled load requires a current greater than the Arduino's digital pins can handle. This transistor allows the Arduino to control a relay that draws a larger current without overloading the Arduino's digital pins. When the Arduino receives a signal from a sensor indicating an electrical fault, it activates the transistor to disconnect the relay and secure the system. Additionally, researchers can equip the system with additional components such as a flyback diode and a capacitor. The flyback diode is installed parallel with the relay coil to mitigate any potential reverse voltage spikes that may occur when the relay is turned off. Meanwhile, a capacitor can be installed to dampen electromagnetic interference (EMI) that could potentially disrupt the overall system's performance. Although these components are not directly connected to the Arduino, they still serve to protect the system from damage caused by voltage or current spikes. To increase user awareness of the system's status, researchers can also add visual and audible indicators, such as LEDs and buzzers, connected to the Arduino's digital pins. When an electrical fault, such as an overcurrent, is detected, the LED will light up and the buzzer will sound as a warning. This signals the operator to take immediate preventative or corrective action.

After the systemOnce the protection is connected to the Arduino and all components are ready to use, researchers must perform testing and calibration to ensure that the sensors are working properly and are responsive to changes in voltage or current. This testing is important to ensure that the protection system not only functions properly but also provides optimal protection against component damage. With these steps, the protection system that was previously not connected to the Arduino Uno can now be integrated directly. This smarter and more responsive control to electrical disturbances will ensure that the solar-powered smart chicken feeder can operate safely and efficiently, as well as extend the life of the system's key components.

Table3. Performance Data CollectionSmart Chicken Feeder Relay

No	Parameter	Measurement Results (Field)	LimitNormal	Information
1	VoltageRelay Activation	4.9 V	4.5V - 5.5V	Voltagerelay activation accordingly
2	Relay Activation Current	38 mA	≤ 40 mA	According to the capabilities of Arduino Uno

 ISSN 2722-4635

No	Parameter	Measurement Results (Field)	LimitNormal	Information
3	VoltageRelay Load	30 VDC	≤ 3 0 V D C	According to 5V relay specifications
4	Relay Load Current	8A	≤ 10A	According to 5V relay specifications
5	Voltage SurgeCome back	0.65 V	≤ 0.7V	Surgewithin safe limits
6	TimeRelay Response	9 ms	≤ 10 ms	Responsefast
7	Operating Temperature	34 °C	0°C- 70°C	Temperature within safe limits

Based on the table it can be seen thatHow the protection components connected to the Arduino Uno, such as current and voltage sensors, play a role in ensuring the system operates safely and according to established specifications. The following is information about the protection system, along with measurement results, in the table:

a. VoltageRelay Activation (4.9 V)
   LimitNormal: 4.5V - 5.5V
   Description: VoltageThe measured relay activation voltage is 4.9V, which is within the normal range. The protection system ensures that the voltage received by the relay does not exceed limits that could cause damage to system components and remains within the Arduino Uno's compatible specifications. If a significant voltage drop occurs, the protection system will detect this condition using a voltage sensor and can stop the relay from operating to prevent damage.
b. Relay Activation Current (38 mA)
   Normal Limit:≤40 mA
   Description: Relay activation currentThe measured current is 38 mA, which is still below the normal limit (≤40 mA). This indicates that the current drawn by the relay when active is within the capabilities of the Arduino Uno's digital pins, which have a current capacity of around 20 mA. By using a driver transistor such as the 2N2222, the protection system can ensure that higher currents can be safely controlled without overloading the Arduino pins.
c. Relay Load Voltage (30 VDC)
   Normal Limit: ≤30VDC
   Description: VoltageThe measured relay load is 30 VDC, which is within the established normal limit (≤30 VDC). The protection system is equipped with a voltage sensor that monitors the voltage applied to the relay load. If the voltage exceeds the safe limit, such as in the case of a voltage surge, the Arduino can respond by disconnecting the relay to prevent damage to the motor or other devices.

Table 4. Automatic Feeding Performance Testing

No	Setting Time	Actual Time	Time Difference	Feed Out	Status
1	08:00	08:00	0 seconds	100 grams	Succeed
2	12:00	12:00	1 second	100 grams	Succeed
3	16:00	16:01	1 second	100 grams	Succeed
4	20:00	20:00	0 seconds	100 grams	Succeed
5	08:00 (day 2)	Actual Time	0 seconds	100 grams	Succeed

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Wiring Protection System Test Results

Testing was conducted to determine the performance of the wiring protection system in maintaining the stability of the smart chicken feeder. The testing included checking cable connections, measuring voltage, testing motor loads, and simulating simple electrical faults.
The test results show that:

1. The wiring system is capable of flowing a stable electric current from the solar cell energy source to the battery, then to the Arduino and the drive motor.
2. Fuses can work as a safety device when excessive current occurs, thus preventing damage to the main components.
3. The use of relays helps control the flow of electricity to the motor automatically according to the Arduino program.
4. Grounding systems help reduce the risk of damage due to static electricity.
5. No excessive increase in cable temperature was found during the testing process.

From the test results, it can be seen that the wiring protection system is able to function well in protecting electronic circuits from potential electrical interference.

System Feasibility Analysis

Feasibility analysis is carried out based on technical, operational and economic aspects.

a. Technical Aspects
Technically, the wiring protection system meets basic standards for small-scale electrical installations. The selection of cables, fuses, relays, and grounding systems has been tailored to the equipment's power requirements. The system operated stably without significant disruptions during testing, demonstrating its technical feasibility.

b. Operational Aspects
From an operational standpoint, the smart chicken feeder is easy to use because the system operates automatically based on pre-programmed times. Farmers simply need to fill the feeder into the provided container. This saves time and effort, especially for farmers with large chicken populations.

c. Economic Aspects.
From an economic perspective, the prototype's production costs are relatively affordable because it uses readily available components. The use of solar cells also helps reduce electricity consumption from the state electricity company (PLN), resulting in more efficient operational costs in the long run. Based on these three aspects, the protection and wiring system on the smart chicken feeder is considered suitable for use and further development.

A wiring protection system plays a crucial role in maintaining the stability of an automatic chicken feeder. Without a proper protection system, electronic components can potentially be damaged by excessive current or other electrical disturbances. The use of fuses and relays has been shown to improve system safety and reduce the risk of device damage. The use of renewable energy in the form of solar cells also adds value to the system by reducing dependence on conventional electricity. This is particularly beneficial for farmers in areas with limited electricity access. However, this study faces several limitations, such as the use of miniature equipment and the small-scale testing. Therefore, further research is needed to test the system on a larger farm scale and to add IoT-based monitoring features to monitor the equipment's performance in real time.

Table 5. System Feasibility Analysis Results

Aspect	Parameter	Results	Information
Technical	Wiring system	Good	No short circuit
Technical	Fuse protection	Functioning	Safe
Operational	Ease of use	Easy	Automatic
Operational	Maintenance	Easy	Simple components
Economical	Manufacturing costs	Affordable	Efficient
Energy	Solar cell	Stable	Saving electricity
Conclusion	System feasibility	Worthy	Can be used

5. Conclusion

This research discusses the feasibility analysis of the protection and wiring system on a microcontroller-based smart chicken feeder with solar energy source. The results of the study indicate that the designed system is able to work automatically according to the programmed feeding time, thereby increasing operational efficiency and reducing dependence on manual labor in chicken farming activities. The integration of the Arduino microcontroller, timer module, drive motor, and solar cell energy source provides an efficient and energy-saving technological solution to support the scheduled and consistent feeding process. From the electrical side, the implementation of a wiring protection system consisting of fuses, relays, and a grounding system can improve the safety and stability of the system. The test results show that the voltage generated by the solar cell is in the range of 12.8 V to 14.3 V, thus able to meet the power requirements to operate the microcontroller and drive motor. The designed wiring system is able to channel electric current stably under various load conditions, both when the system is in standby mode, when the microcontroller is active, and when the motor is running. During the testing process, no indications of cable overheating, short circuits, or component damage were found, indicating that the protection system functioned well in anticipating electrical disturbances such as excessive current and voltage fluctuations. The feasibility evaluation was conducted based on technical, operational, and economic aspects. From a technical aspect, the system demonstrated stable performance and met basic standards for low-voltage electrical installations. From an operational aspect, the automation system was able to improve the accuracy of feeding schedules, reduce human error, and increase the efficiency of livestock workers' work time. From an economic aspect, the system was considered quite affordable because it used components that are readily available in the market and utilized renewable energy, which can reduce operational costs in the long term. Overall, the research results indicate that the protection and wiring system of the smart chicken feeder is feasible for implementation, especially on small- to medium-scale chicken farms. Integrating the electrical protection system with renewable energy technology can improve system reliability while minimizing the risk of damage due to power outages. Further research can develop the system by adding Internet of Things (IoT)-based monitoring features, enhancing protection against voltage surges, and conducting testing on larger farms to more comprehensively ensure system performance and reliability.

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